

EFFICACY/PERSISTENCE OF INDIANMEAL MOTH GRANULOSIS VIRUS APPLIED TO NUTS

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The Indianmeal moth (IMM) granulosis virus (GV) was first isolated and characterized in 1968 by Arnott and Smith. As a group, the Baculoviridae are considered to be safe because extensive testing has demonstrated their safety. Twelve have been registered world-wide. In the late 1960s, interest increased in the use of microbial agents to control stored product pests in durable commodities. Studies by Hunter *et al.* (1973) demonstrated efficacy against IMM infestations in raisins, almonds and walnuts. Cowan *et al.* (1986) developed a production/formulation method for IMM-GV which was later patented (Vail 1991). Johnson *et al.* (1998) incorporated the GV in tests combined with controlled atmospheres for initial disinfestation of IMM populations in unshelled walnuts followed by treatment with the GV for long term storage. The IMM-GV provided excellent protection of walnuts even with severe IMM pressure for a period of 4 months. Similar tests were conducted with almonds.

After the tests described above were completed, we determined the persistence/efficacy of GV on treated nuts through a period of 2 years. Immediately after the initial 4 month test, treated and control walnuts and almonds were frozen to kill any IMM remaining in the commodities. Thereafter walnuts or almonds were removed and placed in sealed storage at 80°F. Samples were removed bi-monthly, infested with approximately 1,000 IMM eggs, and incubated at 80°F for 6 weeks. The tests were replicated twice in time. Following incubation the nuts were observed for numbers of IMM adults and damage (pin hole, moderate, and severe).

Results of these studies showed that IMM-GV would persist for at least 2 years. As time passed, the titre of the virus gradually was reduced as was evidenced by increase in damage in time. However, moth emergence was reduced by more than 90% through the test period with both commodities. Damage to almonds exceeded that of walnuts probably due to easier access of larvae to the kernels by way of cracked and thinner shells. Infestation rates used in these tests are unreasonably high and bias the data towards more damage than would likely occur commercially. Our grading procedures are also likely to be much more rigid than would be used commercially. The virus is now proceeding through registration with the United States Environmental Protection Agency.

References:

Arnott, H. J. and K. M. Smith. 1968. An ultrastructural study of the development of a granulosis virus in the cells of the moth, *Plodia interpunctella* (Hübner). J. Ultrastruct. Res. 21: 251–268.

Cowan, D. K., P. V. Vail, M. L. Kok-Yokomi and F. E. Schreiber. 1986. Formulation of a granulosis virus of *Plodia interpunctella* (Hübner) (Lepidoptera: Pyralidae): Efficacy, persistence, and influence on oviposition and larval survival. J. Econ. Entomol. 79: 1085–1090.

Hunter, D. K., S. S. Collier and D. F. Hoffmann. 1973. Effectiveness of a granulosis virus of the Indian meal moth as a protectant for stored inshell nuts: preliminary observations. J. Invertebr. Pathol. 22: 481.

Johnson, J. A., P. V. Vail, E. L. Soderstrom, C. E. Curtis, D. G. Brandl, J. S. Tebbets, and K. A. Valero. 1998. Integration of nonchemical, postharvest treatments for control of navel orangeworm (Lepidoptera: Pyralidae) and Indianmeal moth (Lepidoptera: Pyralidae) in walnuts. J. Econ. Entomol. 91: 1437–1444.

Vail, P. V. 1991. Novel virus composition to protect agricultural commodities from insects. U.S. Patent No. 07/212,641.